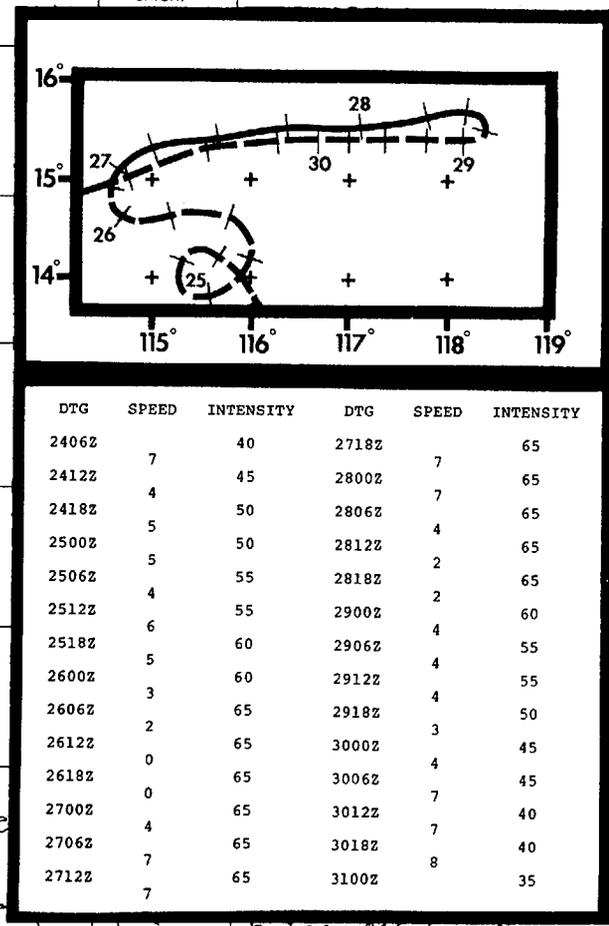
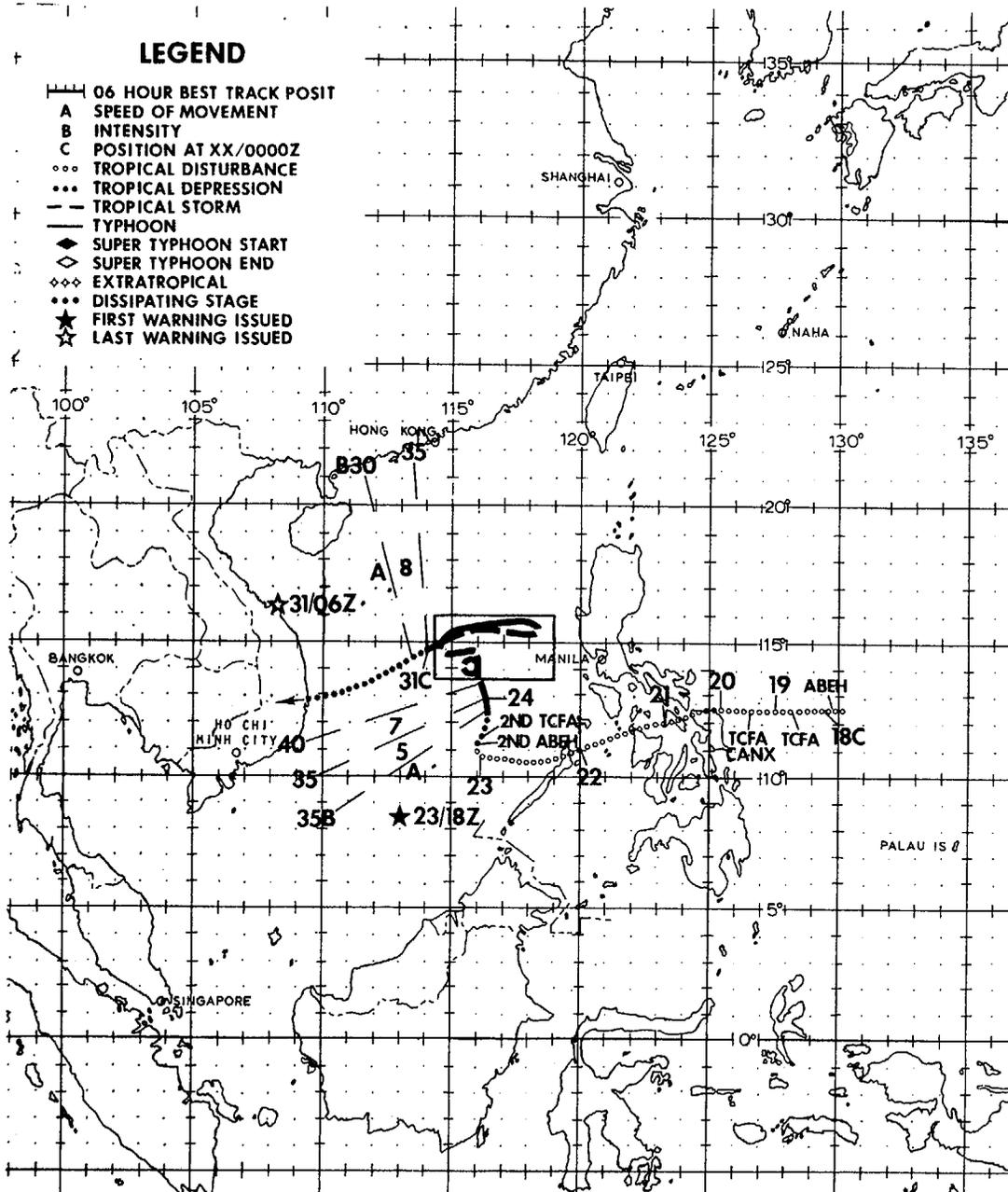


# LEGEND

- 06 HOUR BEST TRACK POSIT
- A SPEED OF MOVEMENT
- B INTENSITY
- C POSITION AT XX/0000Z
- ... TROPICAL DISTURBANCE
- ... TROPICAL DEPRESSION
- TROPICAL STORM
- TYPHOON
- ◆ SUPER TYPHOON START
- ◇ SUPER TYPHOON END
- ◇◇◇ EXTRATROPICAL
- ... DISSIPATING STAGE
- ★ FIRST WARNING ISSUED
- ☆ LAST WARNING ISSUED

**TYPHOON  
WARREN**  
BEST TRACK TC-26W  
23 OCT - 31 OCT 1984  
MAX SFC WIND 65 KTS  
MINIMUM SLP 976 MBS



TYPHOON WARREN (26W)

Typhoon Warren was the most erratic moving tropical cyclone of 1984. The system was the subject of two TCFAs. It made both a cyclonic and anticyclonic loop and varied in speed from quasi-stationary for 12 hours to 8 kt (15 m/s). Warren's erratic movements were due to interactions with eastward moving mid-latitude troughs and Super Typhoon Vanessa and due to its location in the monsoon trough.

The precursor of Warren appeared late on 17 October as an area of poorly organized convection at the trailing end of a shear line approximately 300 nm (556 km) northeast of Mindanao. Synoptic data at the time indicated that a broad 15 to 25 kt (8 to 13 m/s) circulation was collocated with the convection and embedded in the monsoon trough. Over the next 24 hours the convection persisted and appeared to be separating from the shear zone while increasing slightly in organization and intensity. This prompted the first TCFA to be issued at 181500Z. Aircraft reconnaissance investigated the alert area at 190159Z and found a broad weak surface circulation with an MSLP of 1006 mb. Satellite imagery now showed the convection to be decreasing which was confirmed by the ARWO who reported that no significant convection was directly associated with the disturbance. The TCFA was cancelled at 191130Z based on the lack of persistent significant convection near the low-level center, strong upper-level easterly winds over the region, and the proximity of the disturbance to land.

Over the next several days the surface circulation weakened and moved west-southwest along the trough axis across the Philippines and entered the South China Sea on 22

October. During this period synoptic data indicated that several weak circulations were embedded in the monsoon trough. Late on 22 October the tropospheric pattern became more favorable for development. Synoptic data showed that west of Palawan a strong northeast monsoon outbreak combined with a moderate southwest monsoon to the south had produced a well-defined surface circulation. Meanwhile, upper-level diffluence developed over the South China Sea on the western edge of an anticyclone located east of Luzon (Figure 3-26-1).

On 23 October the disturbance rapidly developed. Satellite imagery at 230300Z showed that an exposed low-level circulation center was present some 30 to 60 nm (56 to 111 km) southeast of the developing intense convection. Satellite data also indicated that the tightly wrapped surface circulation was moving north towards the convection. The 30 to 40 kt (15 to 21 m/s) east-southeast upper-level wind over the disturbance, while providing some diffluence, which contributed towards development, also hindered the surface circulation from aligning with the convection. At 230600Z the disturbance was again mentioned on the ABEH, followed several hours later by the second TCFA at 231100Z. With continued development evident, the first warning was issued at 1800Z. Infrared satellite imagery at the time of the first warning indicated the surface center was now located on the eastern edge of the Central Dense Overcast (CDO). Although Dvorak satellite intensity analysis on the 231800Z infrared imagery indicated that 35 kt (18 m/s) winds were present, JTWC did not upgrade Warren from

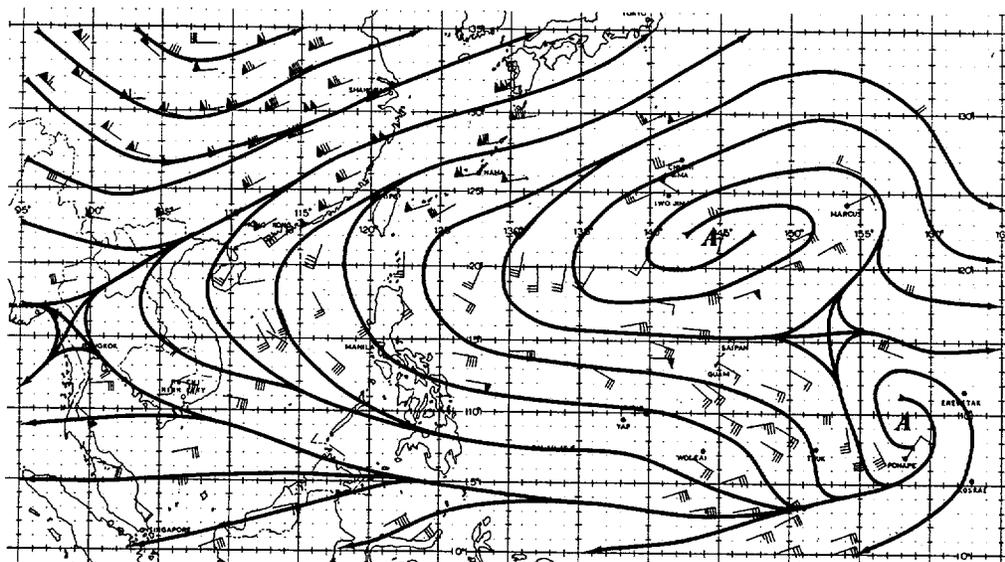


Figure 3-26-1. 200 mb analysis at 230000Z October. The diffluence over the South China Sea was sufficient to allow Warren to develop, although it would later hinder the low-level circulation from becoming collocated with the convection.

depression status until 12 hours later when visual imagery confirmed that the upgrade was warranted. Post analysis indicates this upgrade should have occurred at 231800Z. Warren and the monsoon trough moved north over the next 18 hours. Visual satellite imagery showed that a partially exposed low-level circulation center was now evident on the northeast edge of the convection.

Between 240600Z and 270000Z Warren moved erratically. It did a small cyclonic loop on the 24th and 25th, before resuming a slow westward course followed by a turn to the north and a 12-hour quasi-stationary period between 261200Z and 270000Z. This erratic movement was partially due to Warren's remaining embedded in the monsoon trough and the passage of a mid-latitude trough to the north.

During this period, despite the strong upper-level easterly winds which kept nearly all the convection west of the low-level center, Warren strengthened to typhoon intensity. Aircraft reconnaissance at 260330Z found a band of 60 to 70 kt (31 to 36 m/s) surface winds in the south semicircle of Warren. These winds were the result of the southwest monsoon enhancing Warren's circulation. Warren maintained this minimum 65 kt (33 m/s) typhoon intensity through 281800Z.

Warren became quasi-stationary at 261200Z. At this time Super Typhoon Vanessa (located some 960 nm (1778 km) to the east of Warren in the central Philippine Sea) was moving towards the northwest. Warren now came under the influence of Vanessa's large inflow and a mid-latitude trough passing to the north. (This trough would also be responsible for Vanessa's recurvature). Warren responded by turning to the east-northeast and accelerating to 7 kt (13 km/hr) (Figure 3-26-2). This placed the Philippine Islands north of 14N including Clark AB and the Subic Bay Naval Facilities in imminent danger of being hit by Warren. As a result, all Navy and Air Force Bases in the region were placed in Condition of Readiness I early on the 28th. Fortunately, Warren's interaction with Vanessa and the mid-latitude trough was short-lived sparing the Philippines a direct hit. On 28 October, with Vanessa recurving and the trough axis to the east, Warren slowed and commenced an anticyclonic turn back to the west. At its closest point of approach, Warren was 120 nm (222 km) west-northwest of Clark AB (WMO 98327). As the effects of the trough and Vanessa eased, Warren completed its turn to the west on 29 October. The highest wind reported at Clark AB was 22 kt (11 m/s) at 282055Z, with the total rainfall on 28 and 29 October reaching 8.74 inches (222 mm). No significant damage was reported at any of the military bases.

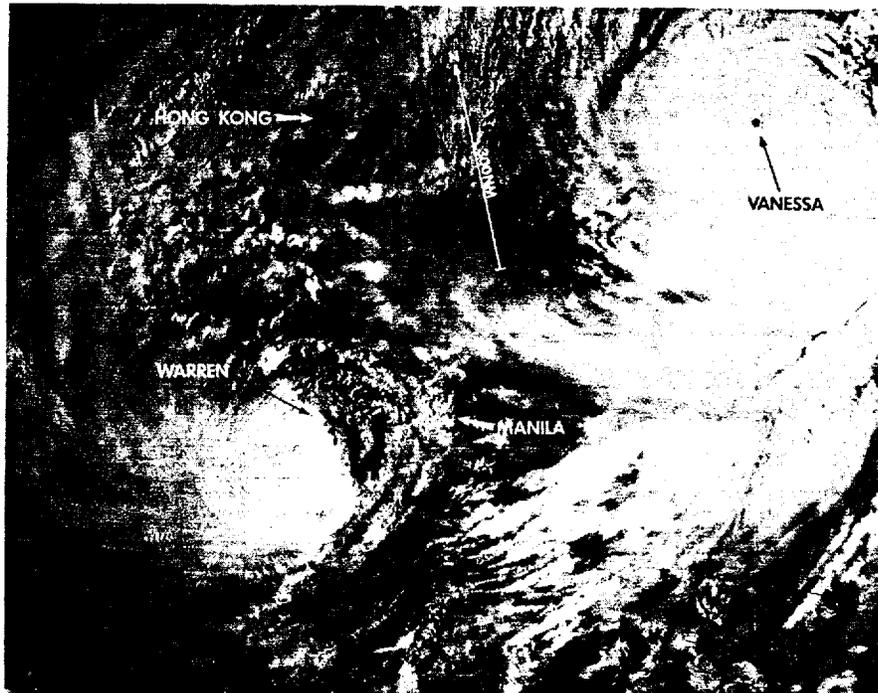


Figure 3-26-2. Typhoon Warren as it moved to the east-northeast under the influence of Super Typhoon Vanessa. Note the effects of the strong upper-level outflow from Vanessa displacing Warren's convection to the west (272326Z October NOAA visual imagery).

Other coastal areas and marine interests were not nearly as fortunate. Heavy rains caused landslides in several coastal towns killing at least 42 people. High seas capsized and sank the inter-island passenger ferry, MV VENUS (746 tons) on 28 October off Torrijos and Bondoc Peninsula. About 36 people were killed but at least 213 passengers were saved. In addition, a 930 ton ship, the Lorenzo Container VIII was sunk on 28 October near 14.0N 120.6E, with eight crew members listed as missing.

Ridging developed in the low to mid-levels in wake of the mid-latitude trough passage. The subtropical ridge now became anchored across the northern part of the South China Sea. Another surge of the northeast monsoon entered the South China Sea on 29 October and began to expand Warren's wind radii in the northern semicircle. Aircraft data indicated that Warren was beginning to weaken as it drew cooler, dryer air into its center. The ARWO reported that the center was surrounded by stratocumulus clouds. This was also evident on satellite imagery as the convection began to decrease in intensity. The deep-layered northeast monsoon flow pushed Warren's low-level circulation to the west-southwest on

30 October and created a significant tilt from the surface to the 700 mb center. On the 31st, the hard convection was associated with the 700 mb center, displaced approximately 60 nm (111 km) west-northwest of the weakening surface center (Figure 3-26-3). JTWC issued the final warning at 310600Z since the 30 kt (15 m/s) surface center was no longer expected to become aligned with the mid-level center and the convection. This prognosis held true, but because Warren's low-level circulation was still in a region of positive low-level vorticity, dissipation occurred much slower than was forecast. Satellite imagery still showed that a well-defined low-level circulation was present 24 hours after the last warning was issued. Warren's displaced convection crossed the central Vietnam coast on 1 November with moderate to heavy rain forecast. The combination of the northeast monsoon and dissipating surface circulation just offshore resulted in 30 to 35 kt (15 to 18 m/s) winds along the Vietnam coast. By 1800Z on 1 November the surface circulation was no longer discernable on satellite imagery and synoptic data on 2 November was inconclusive as to the location of the weakening surface center. Warren had finally dissipated.

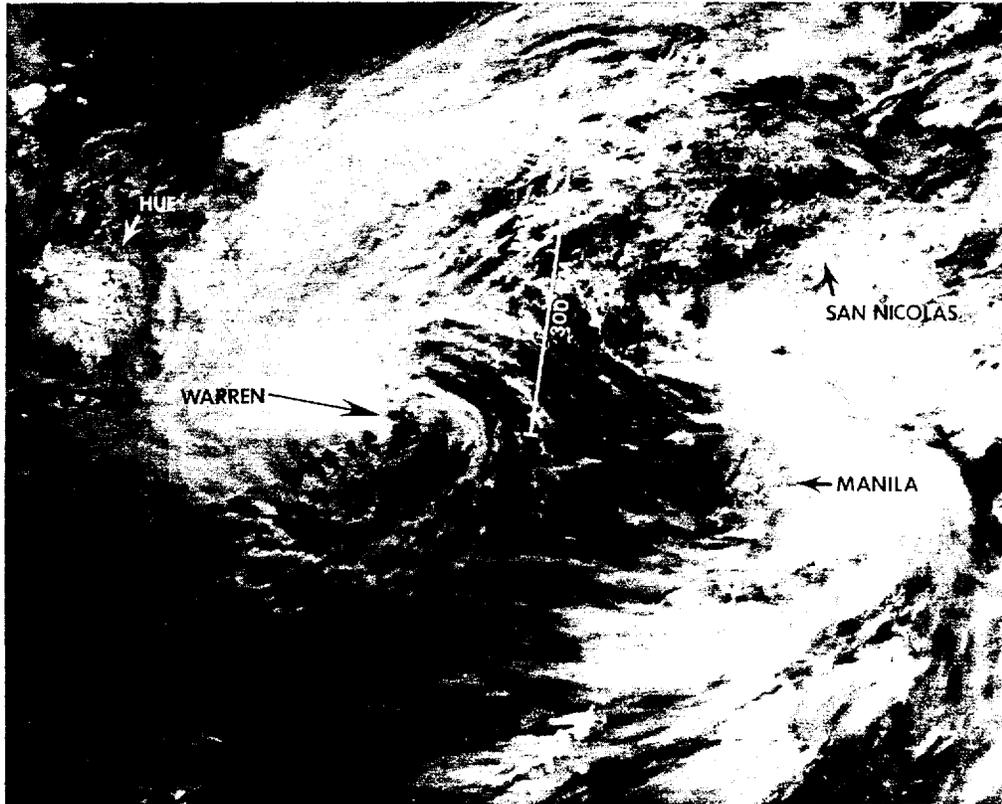


Figure 3-26-3. The partially exposed low-level circulation center displaced 60 to 70 nm (111 to 127 km) southeast of the 700 mb center. The northeast monsoon is pushing the low-level center to the southwest. This imagery was taken just four hours prior to the last warning (310204Z October DMSP visual imagery).